

## **One-Stop Quality Assurance in Radiotherapy using a Ion-Chamber Matrix**

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In this study, a commercial ion-chamber matrix was evaluated as a one-stop tool for radiotherapy quality assurance (QA). The device is the I'mRT MatriXX (Scanditronix-Wellhofer, Schwarzenbruck, Germany). The MatriXX device consists of a 1020 vented ion chamber array, arranged in 24 × 24 cm matrix. Each ion chamber has a volume of 0.08 cm<sup>3</sup>, spacing of 0.762 cm and minimum sampling time of 20 ms. For the investigation of the feasibility of the MatriXX as tool of routine QA, we compared the dosimetric QA parameters such as symmetry, TPR<sub>20,10</sub>, and absolute dose with those from a water phantom. For the first time, we investigated the feasibility of performing geometric QA, such as determination of collimator rotation axis, couch rotation axis, light-radiation field coincidence, and junction test. The result of the dosimetric QA, has shown good agreements, within 1%, between water phantom and MatriXX data. For the geometric QA, we found several merits of MatriXX as a substitute for film-based geometric QA. The geometric QA using MatriXX has made it possible to analyze the degree of the axis deviation quantitatively. The evaluation was based on an analysis of dose distributions and suggested a straightforward way of checking the geometric accuracy. In addition, the geometric QA can be performed in real-time and specially, no time-consuming film processing is needed anymore. Finally, the additional expenses for film and chemicals for processing can be avoided. Besides the routine QA, we have also performed non-uniform fluence beam QA, such as Varian enhanced dynamic wedge (EDW) and IMRT fields. The measured data using the MatriXX were compared with those from the Varian eclipse planning system. All comparisons showed a good correspondence. In conclusion, the MatriXX has been proven to be an adequate and convenient tool for one-stop QA in radiotherapy, both routine QA as well as non-uniform IMRT verification.

**Keywords :** One-Stop QA, MatriXX, Geometric QA